

2019 COMMUNITY RESILIENCE ESTIMATES FOR **HEAT**

Quick Guide

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Small Area Estimates Program

Social, Economic, and Housing Statistics Division

U.S. Census Bureau, Department of Commerce

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Overview

Community resilience is the capacity of individuals and households within a community to absorb the external stresses of a disaster. While the standard Community Resilience Estimates (CRE) measures the social vulnerability that inhibits community resilience, the experimental CRE for Heat measures social vulnerability in the context of *extreme heat exposure*, allowing for new risk factors to account for exposure. In collaboration with Arizona State University’s Knowledge Exchange for Resilience, the 2019 CRE for Heat are produced using information on individuals and households from the 2019 American Community Survey (ACS) and the Census Bureau’s Population Estimates Program (PEP).

Local planners, policy makers, public health officials, and community stakeholders can use the estimates as one tool to help assess the potential resiliency of communities and plan mitigation and recovery strategies. The CRE uses small area modeling techniques. These techniques are flexible and can easily be modified for a broad range of uses (hurricanes, tornadoes, floods, economic recovery etc.).

Background

The CRE was published as an experimental data product in June of 2020 to provide information about the COVID-19 pandemic. As an experimental data product, it was also published in an effort to garner feedback from data users and stakeholders on the quality and usefulness of the new product.

After the publication of the CRE, Arizona State University’s Knowledge Exchange for Resilience (KER) reached out the CRE team to further discuss the product. KER was particularly interested in how the CRE could be leveraged for measuring social vulnerability to heat exposure. KER and ASU as a whole are particularly well known for their research regarding heat exposure and emergency management.

After this interaction, the CRE set out to see how they might measure vulnerability to heat exposure. With consultation from KER, the CRE was updated with modified risk factors to measure vulnerability to heat exposure. This new experimental data product comes with the same goals as the original CRE. Its publication should provide a new useful data source about a

pressing topic and also allow data users and stakeholders provide feedback on potential enhancements.

Data

The [ACS](#) is a nationally representative survey with data on the characteristics of the U.S. population. The sample is selected from all counties and county-equivalents and has a sample size of about 3.5 million housing units each year. It is the premier source for detailed population and housing information about our nation and the communities within it.

We also use auxiliary data from the [PEP](#), the Census Bureau Program that produces and publishes estimates of the population living at a given time within a geographic entity in the U.S. and Puerto Rico. We use population data from the PEP by tract, age group, race and ethnicity, and sex. Once the weighted estimates are tabulated, small area modeling techniques are utilized to create the estimates for the CRE.

Risk Factors

Resilience to a disaster is partly determined by the vulnerabilities within a community. To measure these vulnerabilities, and construct the community resilience estimates, we designed population estimates based on individual and household level risk factors. The risk factors are binary components that add up to 10 possible risks using data from ACS.

The specific ACS-defined measures we use are as follows:

Risk Factors (RF) for Households (HH) and Individuals (I)

- RF 1: Financial hardship defined as:
 - Income-to-Poverty Ratio (IPR) < 130 percent (HH) or
 - 50% < for housing/rental costs (HH)
- RF 2: Single or zero caregiver household - only one or no individuals living in the household who are 18-64 (HH).
- RF 3: Housing quality described as:
 - Unit-level crowding with ≥ 0.75 persons per room (HH) or
 - Live in mobile home boat RV Van or other (HH)
- RF 4: Communication barrier defined as either
 - Limited English-speaking households¹ (HH) or
 - No one in the household over the age of 16 with a high school diploma (HH)
- RF 5: No one in the household is employed full-time, year-round. The flag is not applied if all residents of the household are aged 65 years or older (HH).
- RF 6: Disability posing constraint to significant life activity

¹ A "Limited English speaking household" is one in which no member 14 years old and over (1) speaks only English at home or (2) speaks a language other than English at home and speaks English "Very well."

- Persons who report having any one of the six disability types (I): hearing difficulty, vision difficulty, cognitive difficulty, ambulatory difficulty, self-care difficulty, and independent living difficulty.
- RF 7: No health insurance coverage (I)
- RF 8: Being aged 65 years or older (I)
- RF 9: Transportation exposure described as:
 - No vehicle access (HH) or
 - Work commuting methods with increased exposure to heat (e.g., public transportation) (I)
- RF 10: Households without broadband Internet access (HH)

It is important to note that risk factors one, three, four, and nine are not double flagged. For example, if a household is linguistically isolated and no one over the age of 16 has attained a high school diploma or more education, the people in that household are only flagged once.

The result is an index that produces aggregate-level (tract, county, and state) small area estimates: the CRE. The CRE provide an estimate for the number of people with a specific number of risks. In its current data file layout form, the estimates are categorized into three groups: zero risks, 1-2 risks, and three plus risks.

Differences with Standard CRE

Although the methodology is the same as the standard CRE files, there are some slight differences in risk indicators used to create the CRE for Heat index. Three of the ten risk indicators are somewhat modified from the standard CRE in order to account for exposure related to housing and transportation. For example, whereas the CRE simply had a unit level crowding measure (≥ 0.75 persons per room), CRE for heat has a housing quality exposure indicator that also accounts for structure type (lives in mobile home, boat, RV Van, or other). Also, the original CRE has an indicator for no vehicle in the household, but the CRE for Heat's transportation exposure indicator also contains commute type (i.e., commuters that use public transportation, walking, biking, or other non-personal vehicle method). Finally, whereas the CRE simply had a poverty indicator (income-to-poverty ratio <130), the CRE for Heat's financial hardship indicator also includes whether the household's housing costs are greater than 50%. Otherwise, seven of the 10 indicators are exactly the same as the standard CRE.

Further Information

Community Resilience Estimates Program Website

[<https://www.census.gov/programs-surveys/community-resilience-estimates.html>](https://www.census.gov/programs-surveys/community-resilience-estimates.html)

Technical Help

[<census.askdata@census.gov>](mailto:census.askdata@census.gov)